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Using FEAST to characterize the farming and livestock production systems and the potential to enhance livestock productivity through improved feeding in Gebrekidan, Atsbi-Wonberta District, Tigray, Ethiopia

T. Hagos[1], S. GebreYohans[2], K. GebreMeskel[2], W. GebreYohanse[2], T. Zegey[2], M. Assfaw[2] and J. Wamatu[3]

[1]Tigray Agricultural Research Institute (TARI)

[2]Mekelle Agricultural Research Center (MARC)

[3]International Center for Agricultural Research in the Dry Areas (ICARDA)

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ICARDA
Box 5689, Addis Ababa, Ethiopia
Phone: +251-11-617-2281
Fax: +251-11-617 2001
E-mail: S.Silim@cgiar.org

ILRI
Box 5689, Addis Ababa, Ethiopia
Phone: +251 11 617 2000
Fax: +251 11 617 2001
Email: ILRI-Ethiopia@cgiar.org

Introduction

Atsbi district (*woreda*) is located in the eastern zone of Tigray region, at the the boarder with Afar region. Gebrekidan *kebele* is one of the kebeles in Atsbi *woreda*. This *kebele* has a large livestock population and the livestock sub-sector, particularly sheep production and apiculture, is an important component of the agricultural sector. Despite its huge livestock population, its contribution to the livelihood of the households is limited. One of the factors which limit livestock productivity in the area is severe feed shortage. Thus, the objective of the current study was to assess feed resource availability and utilization using a feed assessment tool (FEAST) within the context of the overall farming and livestock production systems and to determine feed improvement options and interventions.

Study site

Gebrekidan *kebele* is located 14°00'06.03''N, 39°43'30.55''E at an altitude of 2855 meters above sea level (m.a.s.l). It is 83 km from Mekelle City and 18 km from Atsbi town. The average rainfall of the *kebele* is 668 mm per annum and the average temperature is 18°C. The total area coverage of the *kebele* is estimated at 117.554 sq km (ILRI- IPMS report, 2004) and is known by its erratic rainfall which starts at the end of June and ends in mid-August. This *kebele* is one of the drought prone *kebele*s of the *woreda*. There are five administration villages in Gebrekidan *kebele* namely Barka, Atsgebet, Wukro, Hichean and Ketema-Dera with a total human population of 10,148 human populations, 4502 males and 5646 females.

Sampling method

Two tools, the participatory rural appraisal approach (PRA) and FEAST were used to collect information. Farmers were selected based on gender (men and women household head), land size (landless, below average, average and above average), and age group (youth, middle age and elders). Twenty participants were selected. 9 farmers (3 from small landholdings, 3 from medium landholdings and 3 from large landholdings) were selected for individual interviews. The survey was undertaken on 22-23rd December, 2013.

Data analysis

The information gathered during the group discussions was examined and reported. The quantitative data collected from individual key informant farmers were entered into the FEAST excel template (www.ilri.org/feast) and analyzed.

Results

The *kebele* has a crop-livestock farming system. The major crops grown are barley, wheat, fababean, fieldpea and lentil. The livestock production of the *kebele* was dominated by sheep and cattle production.

Table 1: Average land size owned by various categories of farmers in Gebrekidan

Category of farmers	Range of land size(ha)	Percentage of the household found in each category
Landless	0	20
Below average (Small)	< 0.25	10
Average (medium)	0.25	50
Above average (Large)	> 0.25	20

The average farm size in Gebrekidan is 0.25ha (Table 1). Land shortage is a major problem. The *kebele* has one cropping season called *Kiremti* that begins at the end of May and extends to mid-December. The rainy season begins end of June and ceases during the first week of September. The farmers are used their land for different crop such as barely, wheat, faba bean, field pea and lentil (Figure 1). Fallowing is not commonly practiced because of land scarcity. At least 35% of the households in the *kebele* irrigated portions of their land.

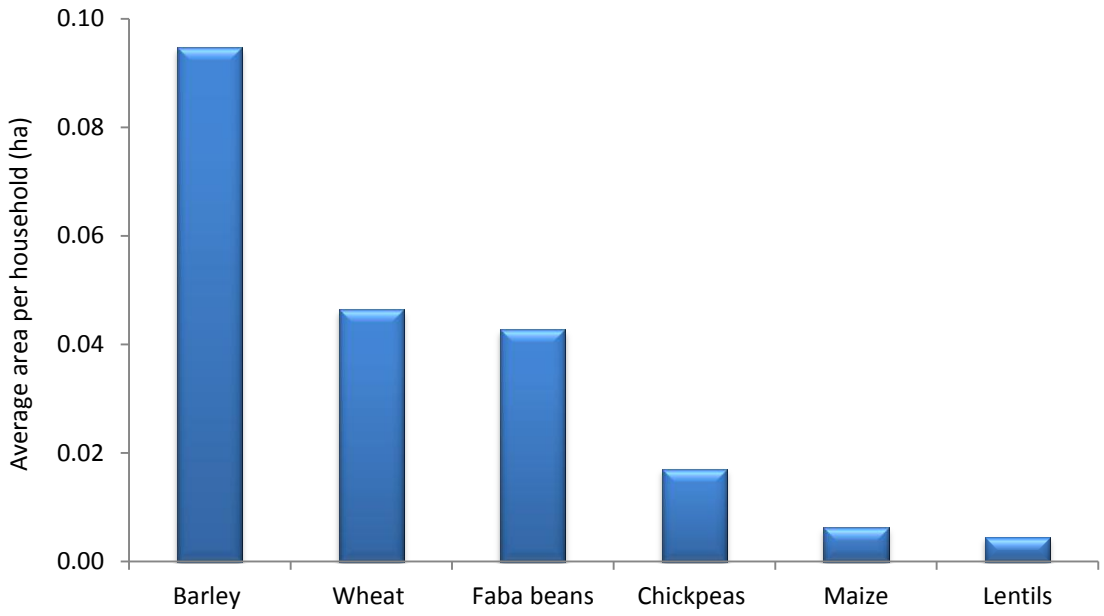

Figure 1: Major crops grown in Gebrekidan

Labour availability is in excess as most of it is hired labour using farmers networking groups (1 to 5 farmers), labour exchange through human and oxen and family support. In the *kebele,* labour is required mainly in May-July (for planting), July-August (for weeding) and October-December (for harvesting and trashing). The labour costs for the three periods are Birr 100, 70 and 100 respectively ($ 3.5 – 5). These labour costs do not include food and local drinks (estimated at Birr 50) provided to the each labourer. The reason for the high cost of labour during planting and harvesting/threshing is because men are involved in these activities. labour costs for weeding are low because only women are involved. Availability of agricultural inputs is a main problem because the farmers have to travel a distance of 18 km to Atsbi town to purchase the inputs.

The main source of income is selling of handicrafts made in the community. Fattening of sheep, goats and cattle also contribute to income (Figure 2). About 30% of the population migrates from the *kebele* for different reasons such as migration to Arab countries for employment work in the construction industry, for trading (mainly animal and grains), marriage and education.

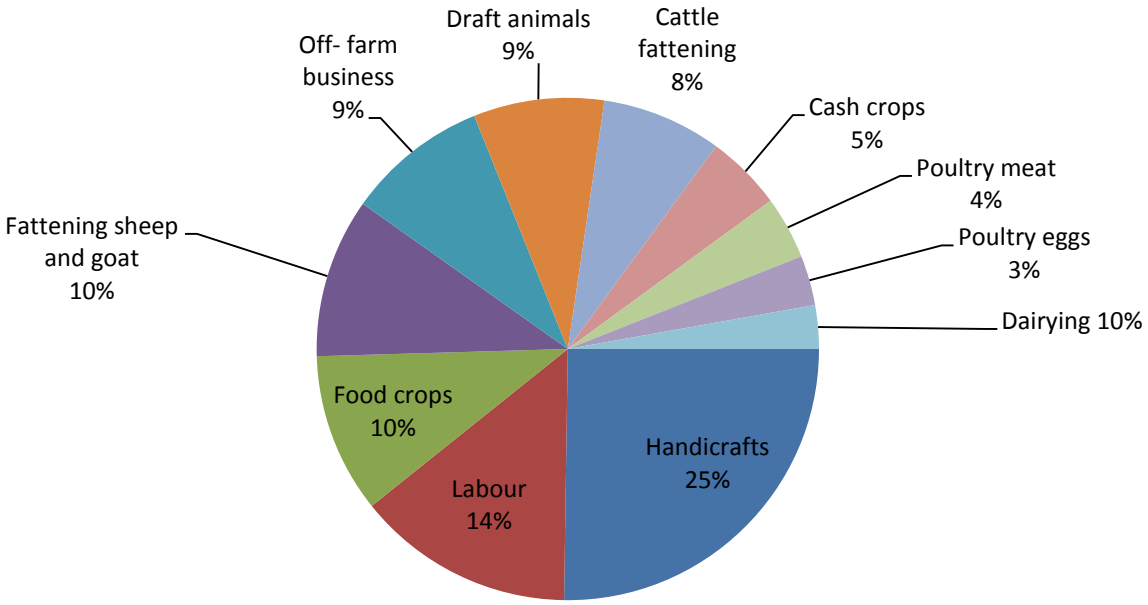

Figure 2: Contribution (%) of livelihood activities to household income in Gebrekidan

There are credit providers in Gebrekidan, however farmers shun the services for various reasons which include low amount of cash that can be borrowed (below Birr 10,000; $500), a high interest rate (15%), group loans (from 3-5 people) and a lot of bureaucracy involved in processing the loans.

Livestock production system

The predominant livestock raised in the *kebele* are sheep, cattle, pack animals, poultry, apiculture and goats (Figure 3). They are reared mainly for milk, meat, honey and wax, sale, gifts (small ruminant and poultry), dung, transport (pack animals), egg and meat (poultry), draft power (oxen, dry cows, donkeys), dung (organic fertilizer), water fetching (donkeys), threshing (oxen and donkey) and prestige (cattle and horses) as shown in Table 2.

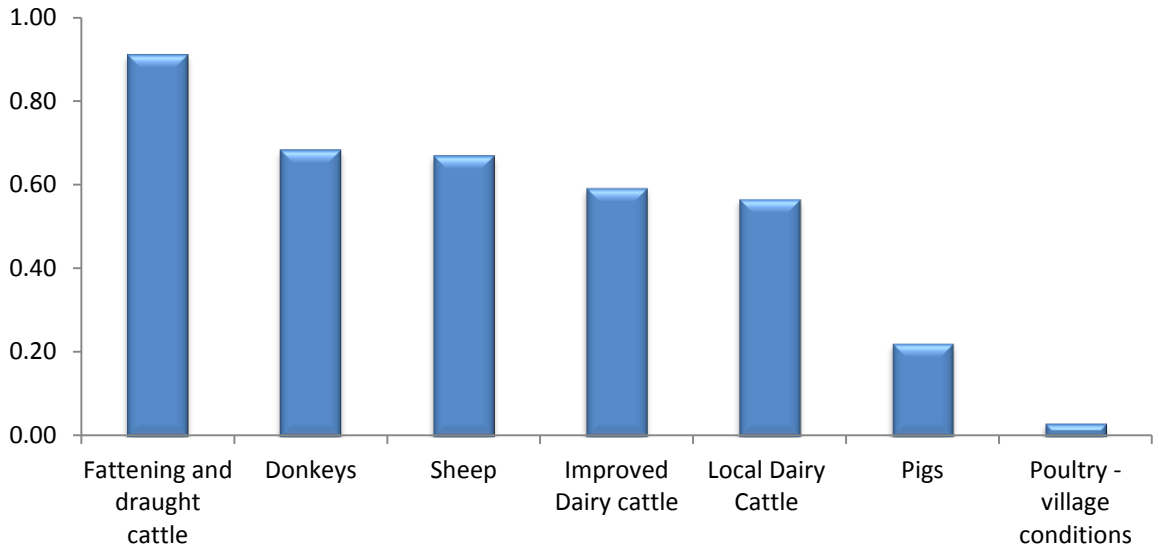

Figure 3: Average livestock species holdings per household in Tropical Livestock Units (TLU) in Gebrekidan

Livestock management

Animal are housed in soil-roofed houses that are open on one side (opposite of the wind direction) locally called as "*afgebella*". These protect the animals from predators, cold, wind and rainfall. All types of animals are placed together except the improved dairy cows (crosses) that are kept in separate rooms of the soil-roofed house. Local breed animals graze freely in the farms while the cross cows are reared within the homesteads.

The *kebele* has a problem of veterinary service, shortage of quality drugs, limited AI service and shortage of skilled veterinarians. The veterinary service is found in Atsbi town and is offered by the *woreda* veterinarians every two months. Cattle drugs are Birr 2-3.5 ($ 0.1- 0.175) per head and Birr 1 ($0.05) for small ruminants. Syringe treatment for cattle is Birr 5-10 ($0.25-0.5) and Birr 5 for small ruminants. Vaccinations are Birr 1.85 ($0.09) and Birr 0.55 ($0.03) for small ruminants. Spraying of external parasite costs Birr 1 ($0.05) for cattle and Birr 0.5 ($0.025) for small ruminants. Farmers complain of low quality AI service because the cows require more than 2 times of repeat AI service on average. The price of AI service is Birr 2 ($0.1) and no payment is required for the repeat services give. Due to perceived low quality of the AI service, farmers prefer bull service at their village that is free. Farmers are increasingly choosing the cross-breed bulls for breeding.

Table 2: Livestock types, uses and ownership per household

Livestock species	**Use**	**Percentage of HH that own the livestock species**	**Average number of animals per hh**
Local dairy cows	Milk, meat, breeding, source of income, manure	75%	2
Improved dairy cows	Milk, meat, breeding, source of income, manure	25%	1

Draught cattle	Meat, breeding, source of income, plough, threshing, fattening manure	80%	2
Fattening cattle	Meat, breeding, source of income, plough, threshing, fattening manure	5%	1
Sheep	Meat, milk, breeding, source of income, gift, manure	90%	10
Goats	Meat, milk, breeding, source of income, gift, manure	10%	5
Poultry village	Meat, egg, breeding, source of income, manure	98%	5
Horse	transportation	5%	1
Donkeys	Transportation, breeding, threshing, source of income		

Feeds and feeding

Traditionally, the farmers combine wheat straw and barley straw to improve the palatability of wheat straw. There is low intake of wheat straw when it is fed alone. Farmers mix forages with the straws when feeding dairy cows. Common forages include napier grass (*Pennisetum purpureum*, sesbania (*Sesbania sesban)* and lucerne (*Medicago sativa*). Straws from pulse crops are fed to animals without mixing them with any supplements. No treatments are carried out on straws. The main feeds purchased are barley straw, hay and wheat bran (Figure 4). The main feedstuffs contributing to the dry matter, metabolizable energy and crude protein content of livestock diets are crop residues, grazing, naturally collected fodder and purchased feed as shown in Figure 5a-c. Crop residues from cereals are the main source of feed during the dry reasons (Figure 6). Legume straws also contribute minimally.

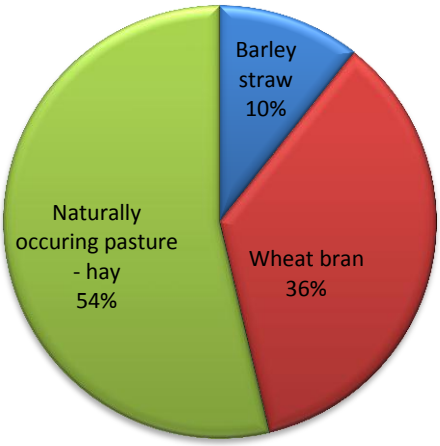

Figure 4: Types of feeds purchased in Gebrekidan

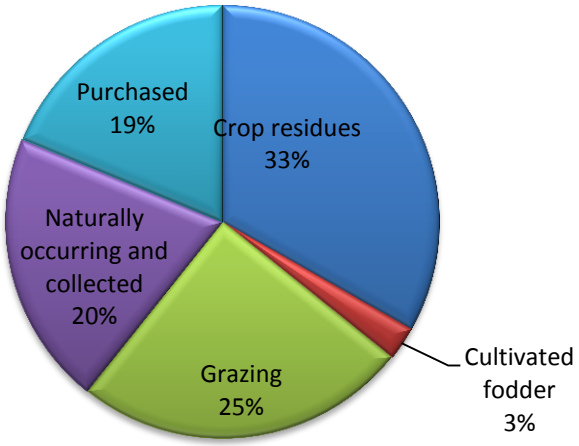

Figure 5a: The contribution made by various feedstuffs to the dry matter content of livestock diets in Gebrekidan

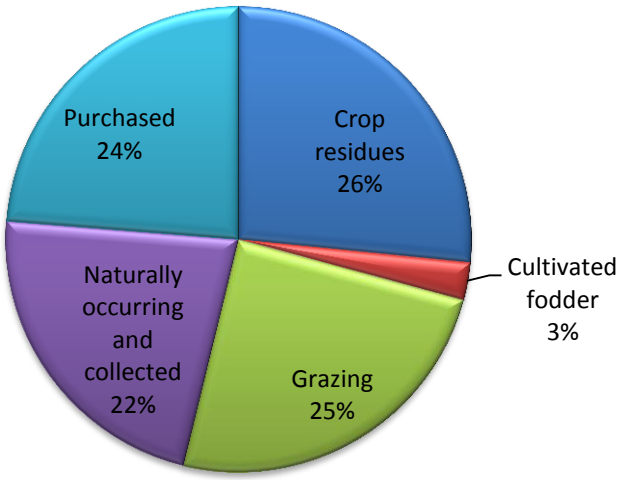

Figure 5b: The contribution made by various feedstuffs to the metabolizable energy content of livestock diets in Gebrekidan

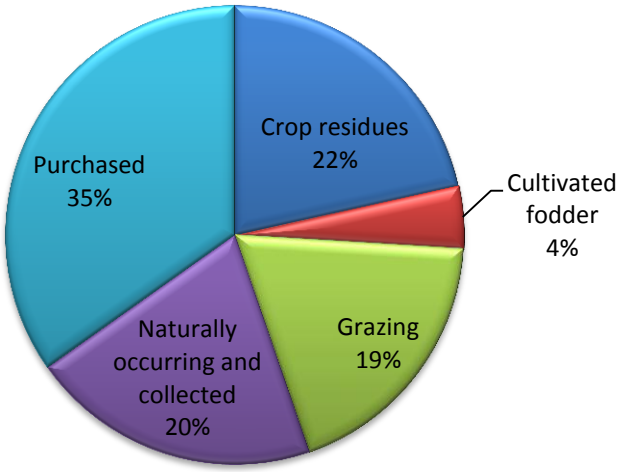

Figure 5c: The contribution made by various feedstuffs to the crude protein content of livestock diets in Gebrekidan

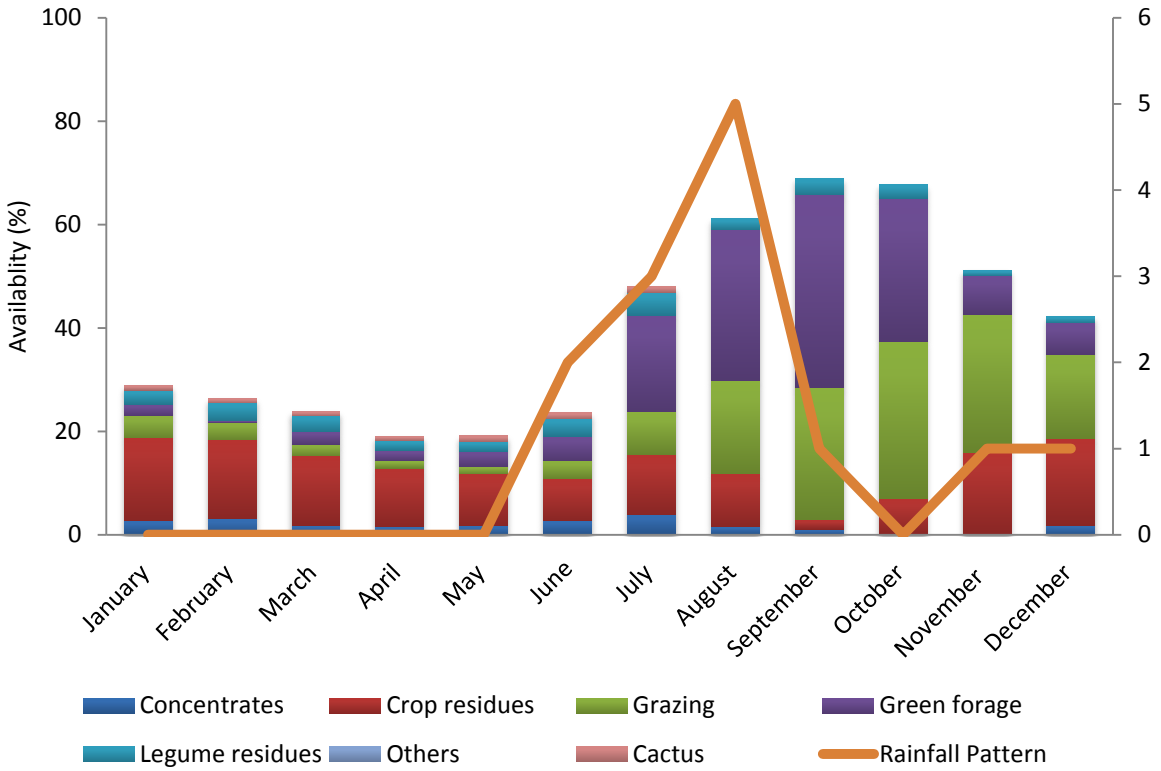

Figure 6: The composition of the livestock diet throughout the year in relation to the rainfall pattern in Gebrekidan

Livestock production constraints, coping mechanisms and possible solutions

The farmers identified the main livestock production constraints, copping mechanism and possible interventions. These are listed in Tables 3 and 4. Water shortage and livestock disease prevalence especially ticks are major constraints. Introducing cattle dips in the *kebele* may be useful.

Table 3: Pairwise ranking of the livestock problems in Gebrekidan

Problems	Feed shortage	Disease and pests	Breed improvement	Land shortage	Water shortage
Feed shortage (FS)	X				
Disease and pests (DP)	DP	X			
Breed improvement (BI)	FS	DP	X		
Land shortage (LS)	FS	DP	BI	X	
Water shortage (WS)	WS	WS	WS	WS	X
Total	2	3	1	0	4
Rank	3rd	2nd	4th	5th	1st

Table 4: Livestock constraints, coping mechanism and possible solution proposed by the farmers

Problems	Rank	Farmers coping mechanisms	Possible interventions
Water shortage	1	Water fetching by donkey from rivers by travelling more than 3 km Digging private water wells	Constructing of water dams Dig ponds in each farmer's home stead and farms
Disease and pests	2	Washing of animals in rivers or water walls Washing the animal's external body using local leaf juice when they get sick Iron heating or punching of skin of the sick animals Keeping the animal house clean	Provide vet technician at *kebele* level Capacity building and awareness creating at the community level Strengthening the existing vet post by sustainable equipments and medicine supply
Feed shortage	3	Decreasing the animals number per household Crop residue and concentrate purchase Feeding cactus cladodes by roasting and chopping Migrating of animals to adjacent areas (Afar region)	Provide concentrate feeds through cooperative at reasonable cost sustainably Supply of improved forage variety seeds Encourage area closure for feed source improvement Conserve enough feed during feed surplus seasons
Breed improvement	4	Using local and cross breed bull service	Provide skilled vets Provide good quality AI service Using known improved bull service
Land shortage	5	Migrating to other areas in search of alternative income sources Efficient utilizing of the existing land	Making more effort to Improve productivity of the given area Classify the existing farm land and hillsides even for youths Communal forest area given to land- less youths

Conclusions

The farmers are seemingly informed about feed issues as seen by the proportion of purchased feeds in the diets of their animals. It is clear that health issues pertaining to livestock need to take precedence in the interventions aimed at increasing productivity of livestock in Gebrekidan. Interventions in relation to improving quality of cereal straws and increased use of pulse straws may be useful.